APPENDIX 25 - A QUALITATIVE PROCEDURE TO ASSESS RANGELAND HEALTH (DRAFT)

[The following is a draft version of a qualitative procedure to assess rangeland health. This draft was prepared by a BLM team headed by Mike Pellant of the BLM Idaho State Office. The procedure was developed in cooperation with academic rangeland scientists, environmental groups, and others interested in rangeland health assessment. Field tests involving these outside interests were held in several places in the West. A BLM Technical Reference incorporating this procedure is in preparation; it should be completed and available by spring 1998. While there may be some minor changes to what is shown in this appendix, the Technical Reference is expected to be substantially similar to the procedure as described here.]

Introduction

Rangeland managers and the public are in a debate about the condition of our nations rangelands. Issues of these conditions continue to be fueled over issues such as grazing fees and state versus federal management of western rangelands. Range managers have struggled to develop cost efficient and accurate assessment procedures since the public rangelands were first allocated.

Early rangeland inventory techniques included combinations of quantitative and qualitative data gathering to identify livestock carrying capacity and stocking levels. An Interagency Range Survey Committee developed a procedure based on ocular estimates of cover and vegetation composition to determine livestock forage production in 1937. Included in this procedure were qualitative procedures to determine soil erosion status (Wagner 1989). Early monitoring procedures (e.g., the Deming Two-phase and Parker Three-Step methods included a “scorecard approach” using indicators to determine “site-soil stability” and usefulness of forage for livestock grazing; Wagner 1989).

The Bureau of Land Management used “soil surface factors” to determine erosional status of large acreages of public lands in the 1970’s (USDI 1973). By 1980 the emphasis in public land monitoring and inventory had shifted to the collection of quantitative data e.g. the Bureau of Land Management's Soil-Vegetation Inventory Method (Wagner 1989).

Interest in the use of qualitative assessment procedures surfaced again in the 1990’s. The Bureau of Land Management published a Technical Reference (TR 1737-9) in 1993 that utilized a qualitative checklist to assess the functioning condition of riparian areas (USDI 1993). The National Research Council published a book on Rangeland Health (West et al. 1994) that included a matrix of indicators to qualitatively assess rangeland health.

Concurrently, a committee of the Society for Range Management developed an approach to identify thresholds of soil stability for sustainable management (Task Group on Unity in Concepts and Terminology 1995). The Western Regional Research Coordinating Committee-40 on Rangeland Research reviewed monitoring and inventory techniques of the various federal land management agencies and concluded that cost effective and efficient assessment techniques were needed (Range Improvement Task Force 1994).

These recent publications served as the impetus and direction for initiation of an interagency workgroup whose task was to develop and field test an assessment procedure for rangeland health that relied entirely on qualitative measurements or judgments. This workgroup benefitted greatly from reviews of historic qualitative assessment techniques and the recommendations on new approaches provided by the Society for Range Management, National Research Council, and the Range Improvement Task Force.

What is Rangeland Health?

The 1994 National Research Council publication, “Rangeland Health, New Methods to Classify, Inventory, and Monitor Rangelands” defined rangeland health as:

> *"the degree to which the integrity of the soil and ecological processes of rangeland ecosystems are maintained"*

Stated differently, healthy rangelands are present when ecological processes are functioning properly to maintain the structure, organization, and activity of an ecosystem over time. The end product is an ecological system that is capable of sustaining the capacity of rangelands to satisfy values and produce commodities.

Ecological processes include the water cycle (the capture, storage and release of precipitation) energy flow (conversion of sunlight to plant then animal matter) and nutrient cycling (the flow of nutrients such as nitrogen and carbon through the physical and biotic environments). Ecological processes functioning within a normal range of variation will support appropriate kinds and proportions of flora and fauna. Direct measure of the efficiency of the ecological processes is difficult due to the complexity of the interrelationships. Therefore, vegetation attributes are often used to estimate the functional status of ecological processes.

Purpose

Certain public land issues become controversial due to the inability of participants to agree if a problem even exists. If the basic procedures to foster the visualization, communication and resolution of rangeland health issues are available, then people with diverse backgrounds can work together to find common ground. A qualitative procedure to assess rangeland health is proposed as an effective communication and assessment tool to arrive at local resolution of rangeland health issues. This procedure is also proposed as a tool to identify areas where rangeland health is satisfactory, at risk or unsatisfactory without establishing cause or trend of the condition.

INDICATORS

Unfortunately, ecological processes are difficult to observe or monitor in the field due to the complexity of most rangeland systems. To characterize the health status of a selected landscape, indicators are used to assess the condition of selected plant and physical environment attributes. An indicator is a component of a system whose characteristics (presence or absence, quantity, distribution) are used as an index of those attributes that are too difficult, inconvenient, or expensive to measure.

Historically, resource inventories and monitoring by land management agencies focused on vegetation attributes (production, composition, density, etc.) and soil stability. Such assessments are inadequate to determine rangeland health because they do not reflect the complexity of the ecosystem. There is no one indicator of ecosystem health; instead a suite of key indicators should be used for an assessment (Karr 1992).

The Qualitative Assessment of Rangeland Health procedure includes four categories:

1. Cover by vegetation lifeform and ground cover for site protection (see attached **Cover Worksheet**).
2. Species abundance relative to dominant plant cover (see attached **Species Abundance Worksheet**).
3. Physical environment status based upon 10 indicators (see attached **Physical Environment Worksheet**).
4. Biotic environment status based upon 8 indicators (see attached **Biotic Environment Worksheet**).

A **Rangeland Health Site Documentation worksheet** (attached) is also completed to record location of assessment, ecological site(s), and other relevant landform features and site uses.

In this Qualitative Assessment Procedure, physical and biotic indicators are evaluated in the field and an appropriate descriptive category is selected for each indicator. The descriptive categories roughly correspond to functioning (healthy), at risk, and improperly functioning (unhealthy) condition.

Physical Environment Rating

In the physical (i.e., abiotic) environment, indicators are used to assess soil and watershed stability. Soil stability and proper watershed function are important because they promote normal capture, storage, and release of water. Indicators of soil and watershed condition are listed in the attached **Physical Environment Worksheet**. Information on the **Cover Worksheet** should be reviewed prior to completing the **Physical Environment Worksheet.**

Biotic Environment Rating

In the biotic environment, indicators are used to assess the integrity, structure, and function of the flora, fauna, and ecological processes. Most indicators in the biotic environment are focused on vegetation attributes since they are the most easy to observe during the short period of time allocated to conducting the qualitative assessment. Biotic indicators are listed in the **Biotic Environment Worksheet**. Both the **Species Abundance and Cover Worksheets** should be reviewed prior to completing the **Biotic Environment Worksheet**. The physical and biotic indicators on the worksheets represents the minimum requirements to subjectively assess health status in most ecosystems. Indicators can be added or deleted for unique situations in an ecosystem.

Ecological Reference Areas

Before assessing the health of specific landscape units, some understanding of the structure, function, and dynamics of the local landscape is required. To obtain this understanding, field personnel use Ecological Reference Areas (ERAs) for training and as comparison areas for site evaluations. An ERA is a landscape unit in which ecological processes are functioning and the vegetation complex has adequate resistance to and resiliency from major disturbance. This concept is similar to that proposed by the Western Regional Research Coordinating Committee-40 on Rangeland Research, which proposed using well-managed rangelands and appropriate relict areas on given ecological sites as benchmarks for assessments (West et al. 1994).

At each ERA, an interdisciplinary team takes photographs and records baseline information) on system attributes and indicator status by completing all worksheets and conducting quantitative cover studies. This information is used for training, future comparisons, and developing photo guides for assessment of landscape units with similar site potentials.

Interpreting Indicators

The critical link between observational measurements of indicators and determining the health status of a landscape is the interpretation process. The indicators are evaluated and a final status determination of physical and biotic status is made. This procedure relies upon the collective experience and knowledge of the interdisciplinary team to rate the indicators and make the final physical and biotic rating.

This process produces separate ratings for the physical and biotic environment for each landscape unit. The physical environment utilizes the same final rating of:

1) Functioning, 2) At Risk, and 3) Improperly Functioning.

The biotic environment is classified into three categories following the wording in the Rangeland Health publication (Committee on Rangeland Classification 1994):

2. Biotically: a) Healthy, b) At Risk, and c) Unhealthy

Determination of the physical and biotic status is based upon a "preponderance of evidence" approach. The relative significance and rating of each indicator are determined by an interdisciplinary team to arrive at the physical and biotic status of a landscape unit.

The Improperly Functioning and Unhealthy ratings are further subdivided into “reversible” and “irreversible” categories. This classification allows the separation of landscape units that will recover with management changes in a 20-30 year period with those that will require artificial restoration involving high labor and material costs. An example of an irreversible, unhealthy ecosystem is the cheatgrass monocultures in Idaho's Snake River Plain. The system is biotically unhealthy and would require competition control (i.e., herbicide or mechanical control of cheatgrass and reseeding with perennial vegetation) to move it back to a healthy rating.

Applications

This process is intended to provide resource managers and the public with a tool to determine the health status of selected rangeland landscapes in a relatively short period of time. The primary purpose is to serve as a communication tool to help educate and train BLM's many customers and stakeholders as well as its own managers and resource specialists.

The assessment procedure does not establish the cause of at risk or unhealthy rangelands; it simply identifies where a problem exists. This procedure is not intended nor designed to replace quantitative monitoring, serve as a trend indicator, or provide data that can be aggregated for a national report on rangeland health.

SUMMARY

Qualitative assessments of rangeland health provide land managers with timely information on site stability and biotic integrity. Early warnings of resource problems allow application of remedial management actions before site degradation proceeds to a nonfunctioning or unhealthy situation. However, more research is needed to quantify indicator attributes and identify thresholds for physical and biotic status. Once this information is available the assessment of rangeland health will become more of a "science" and less of an "art."

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Cover Worksheet

ESTIMATED LIFEFORM AND GROUND COVER (%)							
COVER CLASSES	0	1-5	6-15	16-30	31-50	51-75	75-100
LIFEFORMS							
I - GRASS							
Annuals							
Native Perennial							
Exotic Perennial							
II - FORB							
Annual							
Perennial							
III - SHRUBS							
IV - TREES							
V - SUCCULENTS							
GROUND COVER							
I - LITTER							
II - BARE GROUND							
III - ROCK/GRAVEL							
IV -CRYPTOGAMS							
V -VASCULAR PLANTS							

All ground cover in Categories I.-IV. are estimated from interspace areas only. Category V. Is an estimate of total vascular plant cover.

COMMENTS-

Species Abundance Worksheet

The dominant species are ranked (1-3) according to abundance on the site (1-4, Section I) and by lifeform (1-3, Section II). Abundance is determined based upon cover. Noxious weeds are also identified by species(Section III).

Section I- Dominant Species on Site

1._____

2._____

3._____

4._____

Section II- Dominant species by lifeform

Annual Grasses.

1._____

2._____

3._____

Annual Forbs.

1._____

2._____

3._____

Perennial Grasses

1._____

2._____

3._____

Perennial Forbs

1._____

2._____

3._____

Shrubs and Trees

1._____

2._____

3._____

Section III- Noxious weeds

1._____

2._____

3._____

Comments_____
_____

Rangeland Health Site Documentation

State_____ District/Region_____

Management Unit_____ Watershed_____

Major Land Resource Unit_____

Identification Number or Name (if applicable)_____

Location: Legal T.___ ,R.___ , Sec._____ , ___1/4, ___ 1/4.

Latitude _____ , Longitude _____

UTM Coordinates _____

Observers:_____**Date:**_____

SITE CHARACTERISTICS

Ecological Site_____

Soil Map Unit Name _____

Geology or Parent Material_____ Aspect_____

Slope _____ Elevation_____ft. Topographic position _____

Climate: Annual Precipitation _____

Recent climate: 1)Drought___, 2) Normal____, or 3) Wet Period____

SITE USES

Describe wildlife and livestock use in the area of the assessment_____
_____
_____

Describe evidence of recent disturbance (wildfire, recreation, grasshoppers,etc._____
_____
_____

COMMENTS_____
_____

Physical Environment Worksheet

Relative to Ecological Reference Area(s)-ERA

Indicator	Plus	Intermediate	Minus
1. Flow Patterns	Few, slight deposition	Well defined, small with intermittent deposits	Numerous with soil deposits common
2. Surface Litter	In place or slight movement	Moderate movement, bigger litter displaced	Extreme movement, occurs with each event
3. Soil Movement - Water	None to slight	Moderate, slight terracing & some short pedastals	Significant movement with each event, rocks and plants on pedastals, some roots exposed
4. Soil Movement-Wind	None to slight	Wind scoured depressions evident, small aeolian deposits around plant clumps	Wind scoured depressions common with large aeolian deposits around plant clumps
5. Soil Crusting & Surface Sealing	None to minimal with "soft" physical and/or chemical crusts	Physical and/or chemical crusting obvious with reduced infiltration occurring	Hard physical and chemical crusts widespread on bare ground, strongly reducing infiltration
6. Compaction Layer	None to minimal, not restrictive	Thin, weakly restrictive to roots and water	Extensive with > 1″ width, strongly restrictive
7. Rills	If present, rare and widely spaced	Occasionally present, < 3" deep	Very common at 5' or less intervals, up to 6″ deep
8. Gullies	None to few, if present gullies are healing (veg. on sides & bottom	Few present, active erosion (incised sides) on <10% of length	Numerous with active erosion on 20% or more of length, some headcutting evident
9. Cover- Amount (veg, litter, rock etc.)	Adequate (>X %) to protect site from accelerated erosion.	Marginal (around X %) for site protection, accelerated erosion starting	Inadequate (<X %) for site protection, accelerated erosion evident
10. Cover-Distribution	Well distributed with bare ground areas small	Bare ground areas larger, more numerous and less uniform in distribution	Bare ground areas numerous over large areas, most cover is under trees or shrubs, if present

Ecol Ref Area-->

Test Site(s)-->

Rating: 1. Functioning___ 2. At Risk___ 3. Improperly Functioning: a)Reversible___ or, b) Irreversible___

Comments on Indicators

1. Flow Patterns

2. Surface Litter

3. Soil Movement- Water

4. Soil Movement- Wind

5. Soil Crusting & Surface Sealing

6. Compaction Layer

7. Rills

8. Gullies

9. Cover- Amount

10. Cover- Distribution

Biotic Environment Worksheet

Relative to Ecological Reference Area(s)-ERA

Indicator	Plus	Intermdiate	Minus
1. Community Diversity	Good representation of lifeforms and #'s of species	One or two lifeforms poorly represented, #'s of species 30% of expected (ERAs)	Lifeforms dominated by one class, #'s of species < 50% of expected (ERAs)
2. Community Structure	Good diversity of height, size and distribution of plants including roots (vertical distribution)	Marginal diversity of height, size and distribution of plants and their roots	Plant community dominated by 1-2 lifeforms with poor height, size and distribution of species and their root systems
3. Exotic Plants (or invaders)	Absent or sparse, pose little threat of expansion	Present along roads or scattered in plant community, pose threat of further expansion	Common in plant community with areas of exotic plant dominance
4. Photosynthesis Activity	Length and distribution similar to ecological reference area	Length and distribution is marginal compared to ecological reference area	Length and distribution dissimilar to ecological reference area
5. Plant Status	Majority of plants are productive and alive	Signs of mortality in important species, production of remaining plants declining	Dead or decadent plants readily evident, production of remaining plants is poor.
6. Seed Production	Numbers of seedstalks/seed adequate for stand maintenance of all lifeforms	Plants stressed resulting in reduced seedstalk and seed production of some lifeforms	Seed/seedstalks inadequate for stand replacement (of all lifeforms) during favorable recruitment periods
7. Recruitment	Evidence of recruitment (seed-lings, juveniles or vegetative spread) in last 10 years	Recruitment in last 10 years is spotty and not fully representative of each lifeform	Minimal evidence of recruitment in last 10 years; some lifeforms have a high % of dead or decadent plants
8. Nutrient Cycle	Mechanisms (leguminous plants, cryptogamic crust, litter, etc) are adequate for plant maintenance)	Mechanisms are marginally adequate for plant maintenance and lifeform representation	Mechanisms are inadequate to maintain plant community lifeforms

Ecol Ref Area-> ----------

Test site(s)-->

1. Healthy___ 2. At Risk____ 3. Unhealthy: a) Reversible____ b) Irreversible____

Comments on Indicators

1. Community Diversity

2. Community Structure & Root Distribution

3. Exotic Plants

4. Photosynthesis Period

5. Plant Status

6. Seed Production

7. Recruitment

8. Nutrient Cycle